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Choreutidae of Madeira: review of the known species and description of the male of *Anthophila threnodes* (Walsingham, 1910) (Lepidoptera)

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http://zoobank.org/9CD3F560-D46D-4E63-A309-E74D061799E7

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Abstract. We review and illustrate the four species of Choreutidae recorded from Madeira – *Anthophila threnodes* (Walsingham), *A. fabriciana* (Linnaeus), *Choreutis nemorana* (Hübner), and *Tebenna micalis* (Mann) – and describe and illustrate for the first time the male of *A. threnodes*, as well as the biology of this Madeiran endemic. We provide brief notes on each of the species and give short diagnoses for correctly identifying them. Finally, we discuss previous misidentifications of Madeiran choreutids and the occurrence of choreutids on other oceanic islands.

Introduction

The Lepidoptera fauna of the Madeira Islands consists of only 331 species (Aguiar & Karsholt 2008). This is mainly due to the isolated position of these islands in the Atlantic Ocean, and only to a lesser extent to insufficient collecting efforts. The Macrolepidoptera fauna, and especially the butterflies (Papilionoidea), are considered to be well known, with only a few and mostly invasive species being added in recent years. Among the Microlepidoptera, new discoveries still occur regularly, and a number of taxonomic problems still await resolution.

Madeiran lepidopterology began with Thomas Vernon Wollaston who, for health reasons, stayed in Madeira for long periods between 1847 and 1855 and also made later visits to the island. His results, including descriptions of many new species, were published by himself (Wollaston 1858) and Stainton (1859). Subsequent important contributions to the Lepidoptera fauna of the Madeira Islands were made by Walsingham (1894) and Rebel (1917, 1940). Easier access to the islands by airplane and the use of modern equipment (e.g., mercury vapour lamps) during the second half of the 20th century resulted in an increasing number of specimens available for study. Results of these efforts were summarized in the recent catalogue by Aguiar & Karsholt (2006), and data from that work were used for the checklists by Aguiar & Karsholt (2008) and Karsholt & Nieukerken (2011). A brief introduction to lepidopterology in Madeira was published by Karsholt (2000).

Below we treat the small family Choreutidae. Currently, 413 species of choreutids are described, and most of them are found in the tropics (Rota unpublished database). They are usually diurnal and often brightly coloured. So far four species have been found in Madeira. We describe and illustrate the unknown male and the biology of the endemic *Anthophila threnodes* (Walsingham), and provide images and brief notes on the other three species: *Anthophila fabriciana* (Linnaeus), *Choreutis nemorana* (Hübner), and *Tebenna micalis* (Mann). At the end we discuss earlier misidentifications of Madeiran choreutids.

Methods

Genitalia dissections and terminology follow Rota (2008a). Plant names are from the Plant List website (2010). Photographs of adults were taken using Leica Application Suit MZ 16A and Zerene Helicon Stacker program for stacking subsequent images at ZMUC. Photographs of genitalia slides were taken using an Olympus SZX16 microscope with motorized focus drive attached to an Olympus E520 digital camera and they were then combined by using the programs Deep Focus 3.1 and Quick Photo Camera 2.3 at the Zoological Museum of the University of Turku. All images were improved in Adobe Photoshop CS3.

We conducted standard DNA extraction from abdomens of two specimens of *Anthophila threnodes* (voucher codes noted below) and attempted standard PCR amplification of the DNA barcode (*cytochrome oxidase subunit I*) using primers LCO and HCO (Folmer et al. 1994). When this failed, we used a primer internal to the DNA barcode (K699; Mitchell et al. 2005) in combination with LCO and successfully amplified 326 base pairs from one of the specimens (DNA voucher An_th2; see details under material examined). As this fragment was very short, we attempted to obtain more sequence data and after some trials with the commonly amplified nuclear genes in Lepidoptera (Wahlberg and Wheat 2008), we were finally successful in obtaining two fragments of the nuclear gene GAPDH using newly designed primers by Niklas Wahlberg (GAP1F/GAP2R and GAP3F/GAP4R; primer sequences in Table 1), resulting in a total of 580 base pairs of GAPDH. We carried out a phylogenetic analysis of the concatenated sequences from *A. threnodes* together with the sequences of four other species of *Anthophila*, and another choreutid, *Prochoreutis inflatella*, as an outgroup (Appendix), using MrBayes v.3.2 (Ronquist et al. 2012) running on the CIPRES server (Miller et al. 2010). The data were analysed unpartitioned, with two concurrent runs each with one cold and three heated chains for one million generations, and 25% of trees were discarded as burnin. Convergence was assessed by ensuring that standard deviation of split frequencies was well below 0.05 (it was 0.001 at the end of the analysis), that PSRF values were all very close to 1.000 (they ranged 1.000–1.005), and by visual inspection of plots of log likelihood and all parameters in Tracer v.1.5 (Rambaut and Drummond 2007). Sequence length and GenBank accession number for each species are listed in the Appendix.

Data from the type material are cited literally whereas data from the other material are given in a standardized format.

Table 1. Primers used for PCR amplification of the nuclear gene GAPDH.

Primer pairs and sequence
GAP1F (AARGCTGGRGCTGAATATGT) / **GAP2R** (TAACTTTGCCRACAGCYTT)
GAP3F (GTGCCCARCARAACATCAT) / **GAP4R** (CGGCTGGAGTARCCATAYTC)

Abbreviations

AMFA	Collection of Antonio M. F. Aguiar, Funchal, Madeira.
BMNH	The Natural History Museum, London, U.K.
ICLAM	Insect Collection Laboratório de Qualidade Agrícola, Madeira, Portugal
SIP	Collection of Leo Sippola, Pirkkala, Finland
ZMUC	Zoological Museum, University of Copenhagen, Denmark

Anthophila threnodes (Walsingham, 1910)

http://species-id.net/wiki/Anthophila_threnodes
Figs 1, 2, 9–18

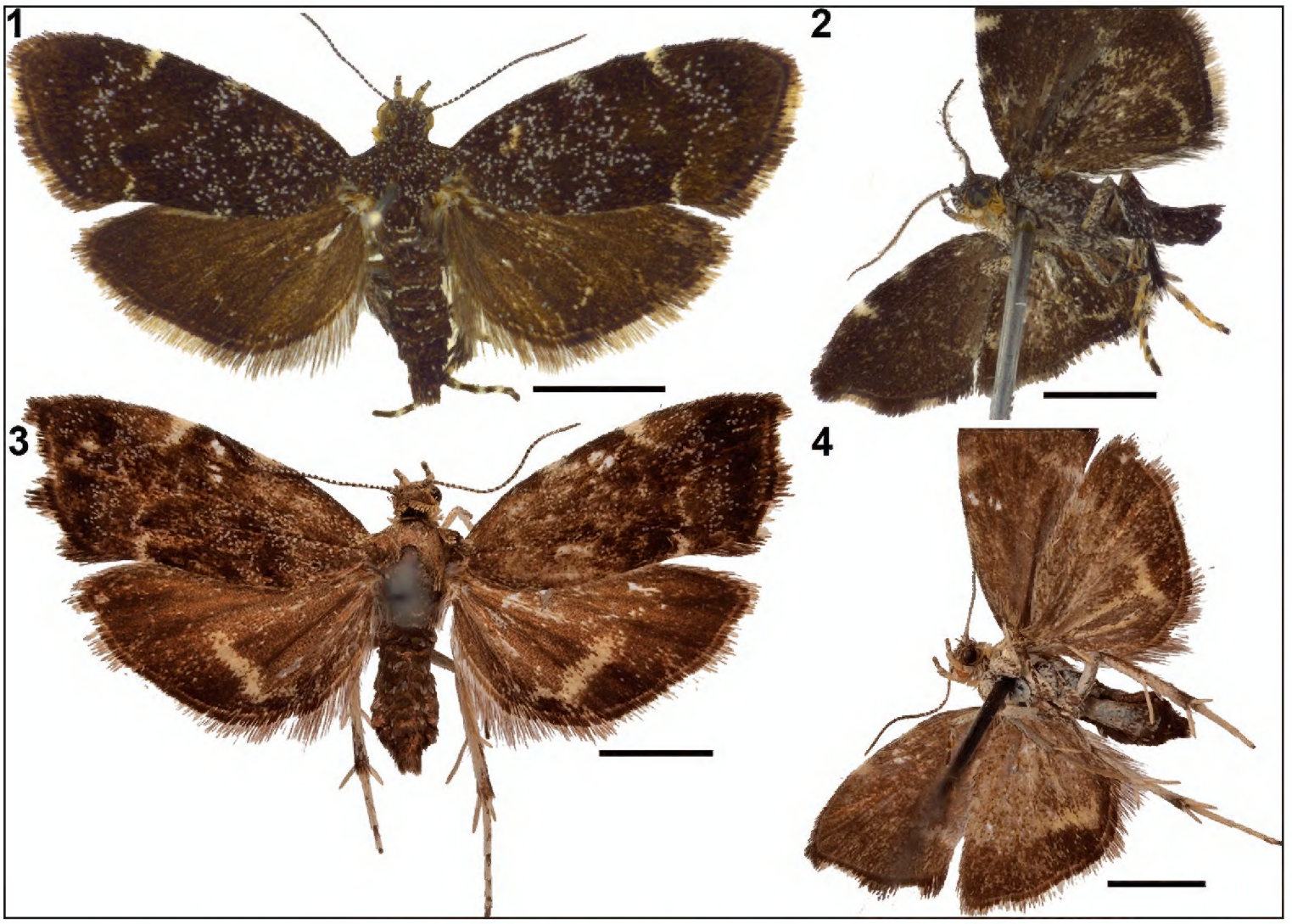
Hemerophila threnodes Walsingham, 1910: 257.

Material examined. Holotype. 1♀, 'B.M. Genitalia Slide 20115 A. Diak' | 'Type' 'Madeira, V. 1886, Leech, 62296' | 'Walsingham Collection 1910-427' | 'Hemerophila threnodes Wals., ♀, Ent. Monthly Mag. 46, p. 257 (1910). Type ♀ (1/1) descr. 62296' (BMNH). 1♂, 1♀, 'Madeira: 1858. Wollaston. BM 1858-21.' | 'Simaethis fabriciana L. teste Stn. Ann-Mag. N. H. (3. s) III. 210, no 4 (1859), Topotype Madeira.' | 'V' [May] (BMNH); 1♂, Funchal, 20–31.iii.1995, leg. L. Sippola, genitalia slide Rota JR2013-05, DNA voucher for extraction An_th2 (ZMUC); 1♂, Cabo Girão, Cruz da Caldeira, 8.vii.1999, leg. A. M. F. Aguiar, genitalia slide Rota JR2013-04, DNA voucher for exraction An_th1 (AMFA); 1♀, Vereda da Entrosa, Arco de São Jorge, 225 m, 12.ii.2000, leg. A. M. F. Aguiar (AMFA); 3♂, 2♀, same data but la. 14.ii.2001, *Urtica* sp., leg. A. M. F. Aguiar & J. Jesus (AMFA, ICLAM); 2♂, 3♀, same data but 200 m, la. 29.xi.2001, *Urtica* sp., leg. A. M. F. Aguiar & O. Karsholt, genitalia slides Hendriksen 5240, Karsholt 5236 (AMFA, ZMUC); 2♀, same data but, 15.v.2003, leg. A. M. F. Aguiar & J. Jesus (AMFA); 1♀, AM 5089, Levada Grande, Boaventura, 285m, 4.iii.2000, larva on *Urtica membranacea*, leg. A. M. F. Aguiar (AMFA); 1♀, Monte, 20.iii.2002, leg. L. Sippola (SIP).

Remarks. *Hemerophila threnodes* was originally described from one female collected in Madeira by J. H. Leech in May 1886. No exact locality was stated. Based on the material collected more recently, we provide a description of the male. We also illustrate female genitalia.

Description. *A. threnodes* is characterized by its dark, almost black wings and a scattering of light bluish scales on the thoracic dorsum and forewing upperside (Figs 1, 2). The forewings have a cream-white spot at two-thirds of costa and another such spot at four-fifths of the dorsum; fringes are black and cream-white beyond black fringe-line. Hindwings are uniform dark brown.

Male genitalia (Fig. 9). Tegumen triangular with small uncus extending from its apex. Papillae anales present as elongate, somewhat elliptical patches with long hairs. Gnathos well developed as a long, somewhat curved, pointed hook. Vinculum ventrally rounded with a small, triangular saccus (obscured in Fig. 9a, but visible in slide JR2013-04, which is not illustrated). Valva broad, somewhat oval, with a pointed costal process and an unsclerotized triangular, rounded extension distally; distally and ventrally covered with hairs. Juxta as a hood-like plate (in Fig. 9b attached to phallus). Phallus shorter than valva, slightly sigmoidal, with a sharp spine at one-third from apex (Fig. 9c).



Figures 1–4. Adults in dorsal and lateral view. 1–2. *Anthophila threnodes*; 3–4. *Anthophila fabriciana* (scale bar = 2 mm).

Female genitalia (Fig. 10). Apophysis posterioris slender, slightly broader at base; ca. 1.5 times as long as anterioris and much less thick. Apophysis anterioris greatly enlarged in the middle, tapering basally and even more so distally. Ostium on segment 7. Ductus bursae very gradually widening into corpus, with a slight twist of about one to two revolutions. Corpus bursae oval, small, with a signum as small patch of dentations (Fig. 10b).

Host plant. *Urtica membranacea* Poir. ex Savigny and probably other *Urtica* spp. (Urticaceae).

Remarks. Larvae have been found in March, May, and November, and adults have been collected in February, March, May, and July, indicating at least two broods. The adult flies during the day. It occurs in open landscapes at low altitudes.

Immature stages and biology (Figs 11–18). Larva is off-white with dark brown spots (Figs 14, 15) and it spins a thin web on or around the young leaves on which it feeds (Figs 12, 13). The pupa is reddish brown (Fig. 16), and in addition to the single rows of dorsal spines on abdominal segments A2–7 (Figs 17, 18) it also has dorsal lacunae – small round holes in a row immediately posterior to the spines.

Diagnosis. *A. threnodes* is characterized by its blackish wings, and should be relatively easy to differentiate from the other Lepidoptera in Madeira. It resembles *A. fabriciana* but the wings of that species are much lighter greyish brown. Male genitalia are very similar to those of *A. fabriciana*, but they differ in having a much shorter spine on the phallus. Female genitalia are similar to those of other species of *Anthophila*, but they differ in only having a hint of spiraliza-

tion in the basal third of the ductus bursae, unlike those of e.g. *A. fabriciana* (L.), *A. abhasica* Danilevsky, and *A. armata* Danilevsky, where the spiralization is apparent. We cannot find differences between the larvae of *A. threnodes* and *A. fabriciana* in their general appearance (the differentiation between the two would likely be possible based on the ultrastructure as seen with the scanning electron microscope, but this has not been done).

Anthophila fabriciana (Linnaeus, 1767)

Figs 3, 4

Phalaena (Tortrix) fabriciana Linnaeus, 1767: 880

Material examined. 1♀, Vereda da Entrosa, Arco de São Jorge, 225 m, 14.ii.2001, leg. A. M. F. Aguiar (ICLAM).

Host plant. *Urtica* sp. (Urticaceae).

Remarks. This is a new record for Madeira. The single specimen was collected at the same place as several *A. threnodes*. We examined photographs of this specimen deposited in the BMNH and are of the opinion that it is correctly identified.

Diagnosis. *A. fabriciana* resembles *A. threnodes*, but differs by its greyish brown wings. It has the cream-white spots apically at costa and dorsum connected by a light zigzag-line, and has a white streak near the margin in the hindwings (Figs 3, 4).

Choreutis nemorana (Hübner, 1899)

http://species-id.net/wiki/Choreutis_nemorana
Figs 5, 6, 19, 20

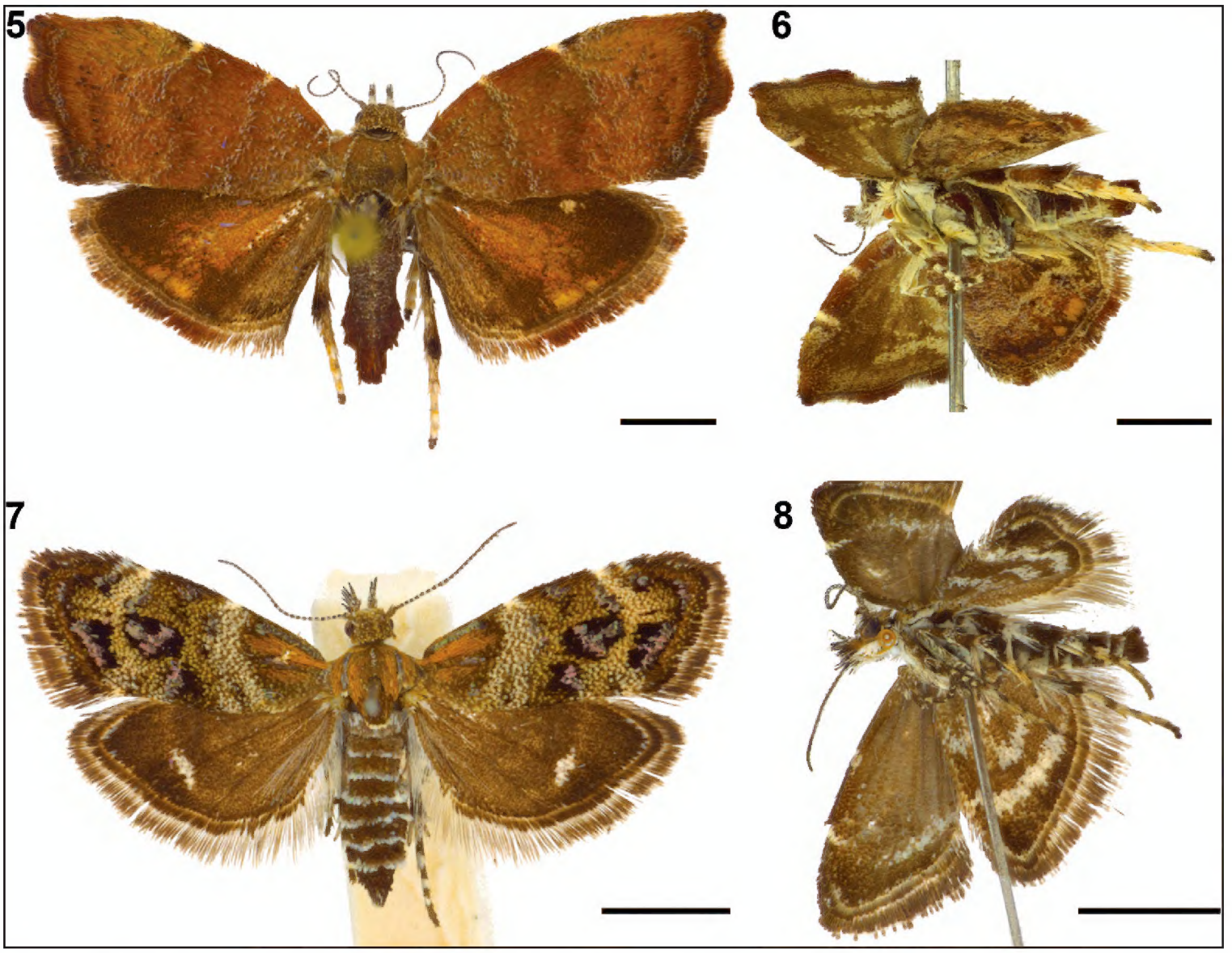
Tortrix nemorana Hübner [1799]: pl. 1, fig. 3.

Material examined. Serra d'Água, Pousada dos Vinhaticos, 660 m, 10♂, 13♀, 12–13.ix.1975, leg. O. Lomholdt & N. L. Wolff; São Vicente, sea level, 1♀, 16.vi.1993; 5♂, 3♀, same data, but larva on *Ficus carica*, leg. O. Karsholt (ZMUC); São Vicente, Ribeira do Inferno, 79m, 3♂, 12.ix.1996, leg. F. Aguiar & J. Jesus (AMFA, ICLAM); Ponta do Pargo, Porto do Pesqueiro, 311 m, 1♂, 1♀, 23.iv.1994, leg. A. M. F. Aguiar (AMFA); Fajã da Nogueira, 600–1000 m, 1♀, 8.x.1994, leg. O. Karsholt (ZMUC); Curral das Freiras, 850 m, 1♂, 20.ix.1997, leg. O. Karsholt (ZMUC); same data, but 597 m, 3♂, 2♀, la. 16.iv.1998, *Ficus carica*, leg. F. Aguiar & J. Jesus; 3♂, 1♀, same data, but 7.v.1998 (ICLAM); Estreito de Câmara de Lobos, Levada do Norte, Garachico, 1♂, 1♀, 538 m, 26.vii.2001, J. Jesus (AMFA, ICLAM).

Host plant. *Ficus carica* L. (Moraceae).

Remarks. This species is common wherever there are *Ficus carica* trees. Larvae, hiding under a thin web, skeletonise mainly young leaves (Figs 19, 20). They have been found in June, and adults have been collected in April–July and September–November, at altitudes from sea level to 1000 m. *C. nemorana* is only a minor pest on figs in Madeira. The adult flies during day. Male and female genitalia were illustrated by Diakonoff (1986): pl. 66, fig. 81 (male), and pl. 142, fig. 81 (female).

Diagnosis. The almost square, brown forewings, and the black and yellow hindwings make *C. nemorana* unmistakeable among Madeiran Lepidoptera (Figs 5, 6).



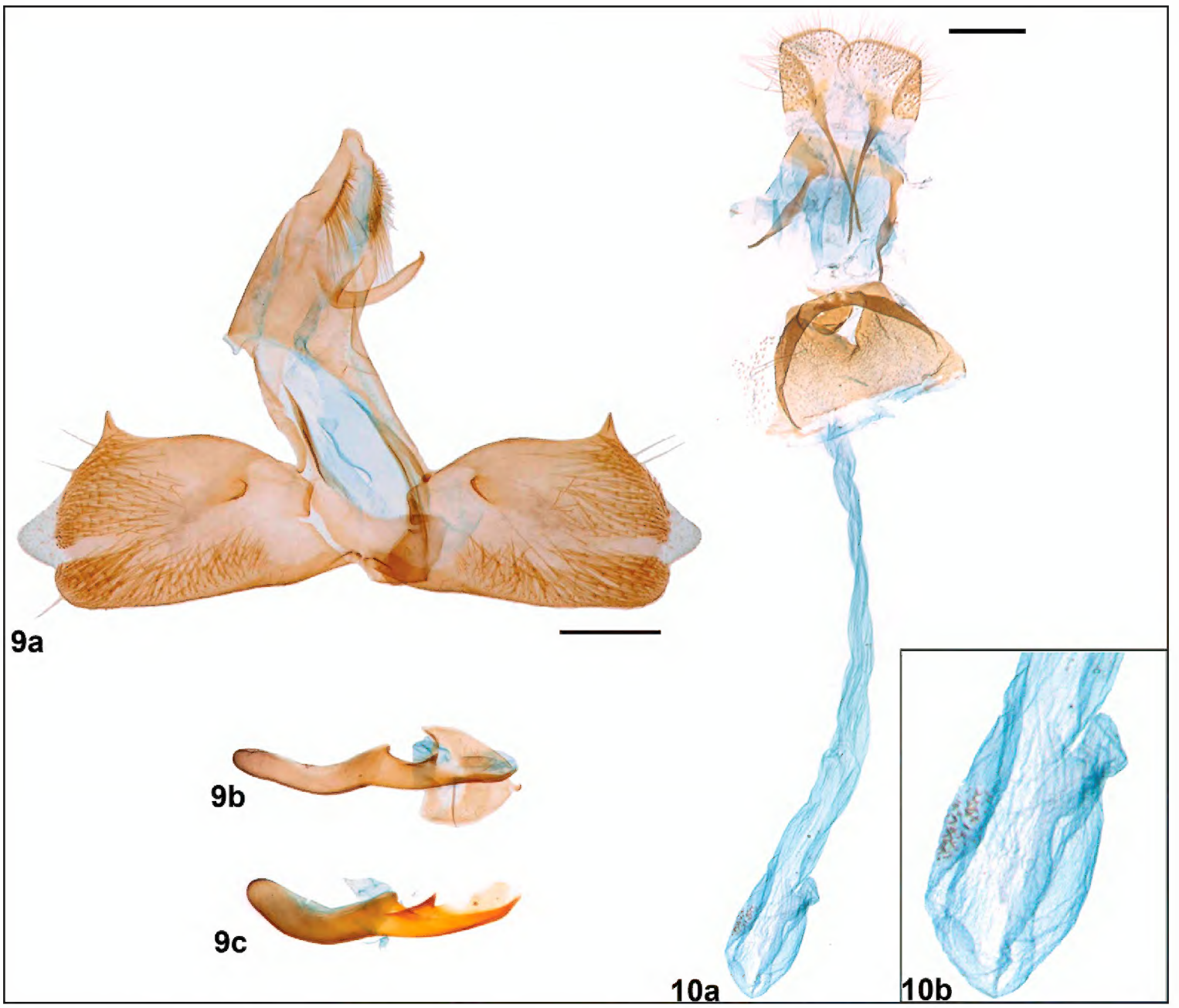
Figures 5–8. Adults in dorsal and lateral view. 5–6. *Choreutis nemorana*; 7–8. *Tebenna micalis* (scale bar = 2 mm).

Tebenna micalis (Mann, 1857)

http://species-id.net/wiki/Tebenna_micalis
Figs 7, 8

Choreutis micalis Mann, 1857: 181.

Material examined. Funchal, Lido, 1♂, 20.viii.1974, leg. E. Traugott-Olsen, genitalia slide Wolff 4298; same locality, but 50 m, 1♀, 18.x.1997, leg. O. Karsholt (ZMUC); Fajã da Nogueira, 1000 m, 4♂, 2♀, 23.viii.1974, leg. E. Traugott-Olsen, genitalia slide Wolff 4294, Rasmussen 4849; same locality, but 600–1000 m, 2♂, 8.x.1994, leg. O. Karsholt, genitalia slide Hendriksen 5765; same locality, but 700 m, 3♂, 2♀, 18.ix.1997, leg. O. Karsholt; same locality, but 1♀, 500 m, 25.xi.2001, leg. O. Karsholt (ZMUC); same locality, but 1♀, 864 m, la. 14.vii.1998, *Helichrysum foetidum*, leg. F. Aguiar & J. Jesus (ICLAM); Caniço, 2♂, 12–18.ix.1977, leg. O. Lomholdt & N. L. Wolff (ZMUC); Ponta de São Lourenço, sea level, 9♂, 4♀, 24–27.vi.1993, 1♀, 11.vii.1993, 1♂, 17.ix.1997, leg. O. Karsholt (ZMUC); Machico, sea level, 1♂, 27.vi.1993, leg. O. Karsholt (ZMUC); Achadas da Cruz, 725 m, 3♂, 2♀, 8.vii.1993, leg. O. Karsholt (ZMUC); Porto Moniz, sea level, 1♀, 9.x.1994, leg. O. Karsholt (ZMUC); Santo da Serra, 700 m, 8♂, 2♀, 26.x.1994, larva on *Helichrysum foetidum*, leg. O. Karsholt, genitalia slide Hendriksen 5766 (ZMUC); 1♂, Estreito de Câmara de Lobos, Jardim da Serra, 1130 m, 22.x.1998, leg. F. Aguiar & J. Jesus (ICLAM); 1♀, Porto da Cruz, Chão das Feiteiras, 1251 m, 12.xi.1998, leg. A. M. F. Aguiar (AMFA); 1♂, 5♀, Santana, Pico, Posto Agrario, 411 m, la. 12.xi.1998, *Arctium minus*; same data, but 1♀ 1.vi.1999, leg. F. Aguiar & J. Jesus (ICLAM); 1♂, Boaventura, Vereda da Entrosa, 130 m, 12.ii.2000; 5♂, 3♀, same data, but 175 m, la. 14.ii.2001,



Figures 9–10. *Anthophila threnodes*: male genitalia (9a), phallus (9b, c) (9a and 9b from slide Karsholt 5236, ZMUC; 9c from slide JR2013-04, ZMUC), female genitalia (10a), inset showing magnified corpus bursae (10b) (scale bar = 0.2 mm).

Helichrysum melaleucum, leg. F. Aguiar & J. Jesus (AMFA, ICLAM); 1♂, 1♂, Estreito de Câmara de Lobos, Levada do Norte, Garachico, 538 m, 26.vii.2001 leg. J. Jesus (ICLAM); 1♀, Machico, Funduras, 605 m, 12.vi.2003, leg. J. Jesus (ICLAM); 1♀, Santana, Achada do Gramacho/ Cais de São Jorge, 267 m, 21.vii.2011, leg. J. Jesus (ICLAM); 1♂, Camacha, Levada dos Tornos, direction Camacha – Monte, 788 m, *Cirsium vulgare*, la. 13.vi.2013, leg. S. Fontinha (ICLAM).

Host plants. *Arctium minus* (Hill.) Bernh., *Cirsium vulgare* (Savi) Ten., *Helichrysum foetidum* (L.) Cass. and *Helichrysum melaleucum* Rchb. (Compositae).

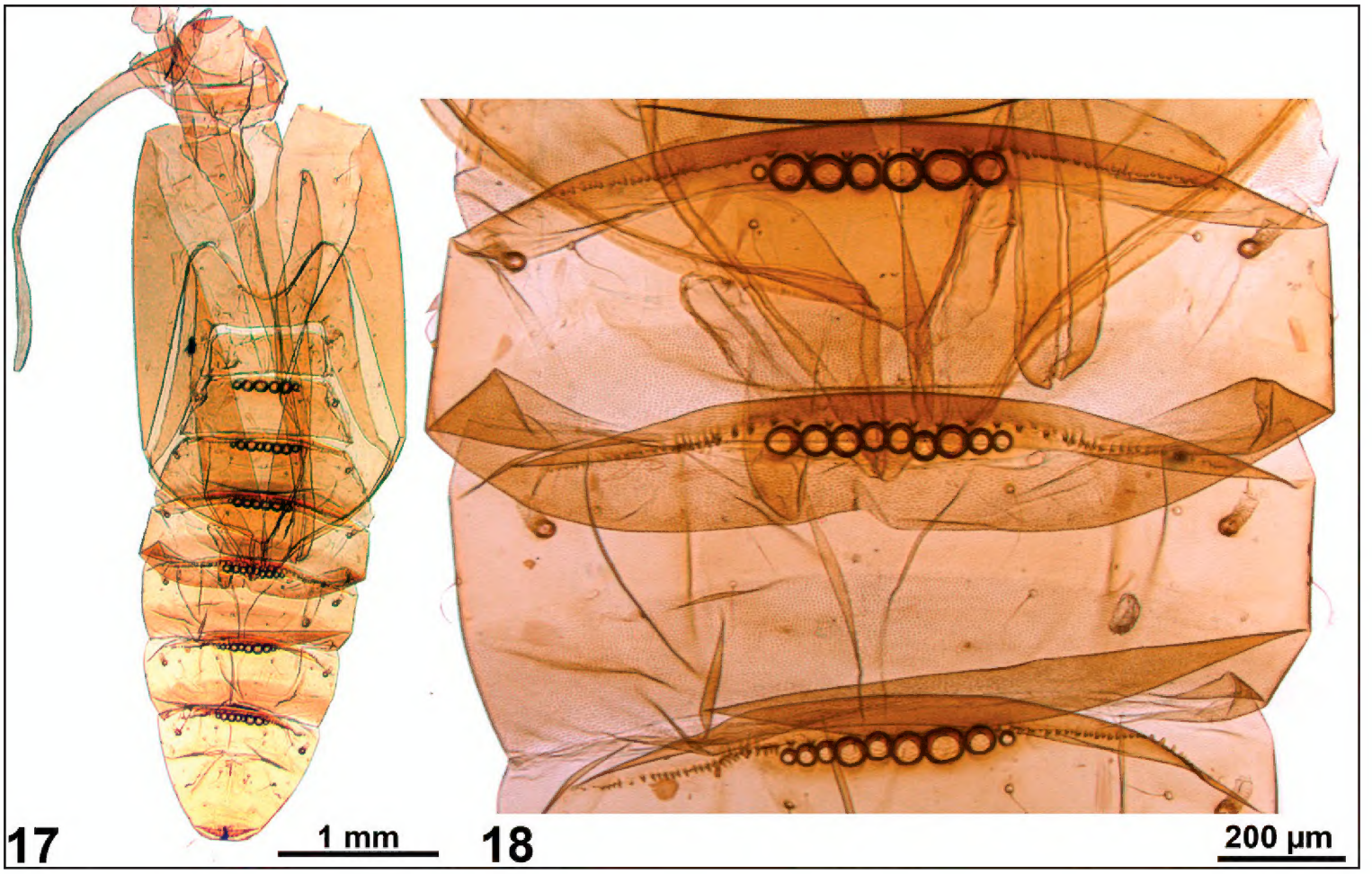
Remarks. Larvae have been found in October, November, February, June, and July, and adults have been collected in all months from June to November, at altitudes from sea level to 1250 m. The adult flies during the day and comes to light. This is a widespread species. In addition to being present on Madeira, it occurs on the Canaries, throughout the Mediterranean, from central and eastern Europe throughout southern Asia to China and Japan, as well as possibly on Marianne Islands, Java, and New Zealand (Diakonoff 1986). It is the only choreutid occurring in the Azores Islands, where it inhabits all larger islands (Karsholt & Vieira 2005).

Figures 11–16. *Anthophila threnodes*: 11. Adult on its host plant; 12–13. Larval webbing tying young leaves; 14–15. Larva; 16. Pupa and an empty pupal shell in the inset.

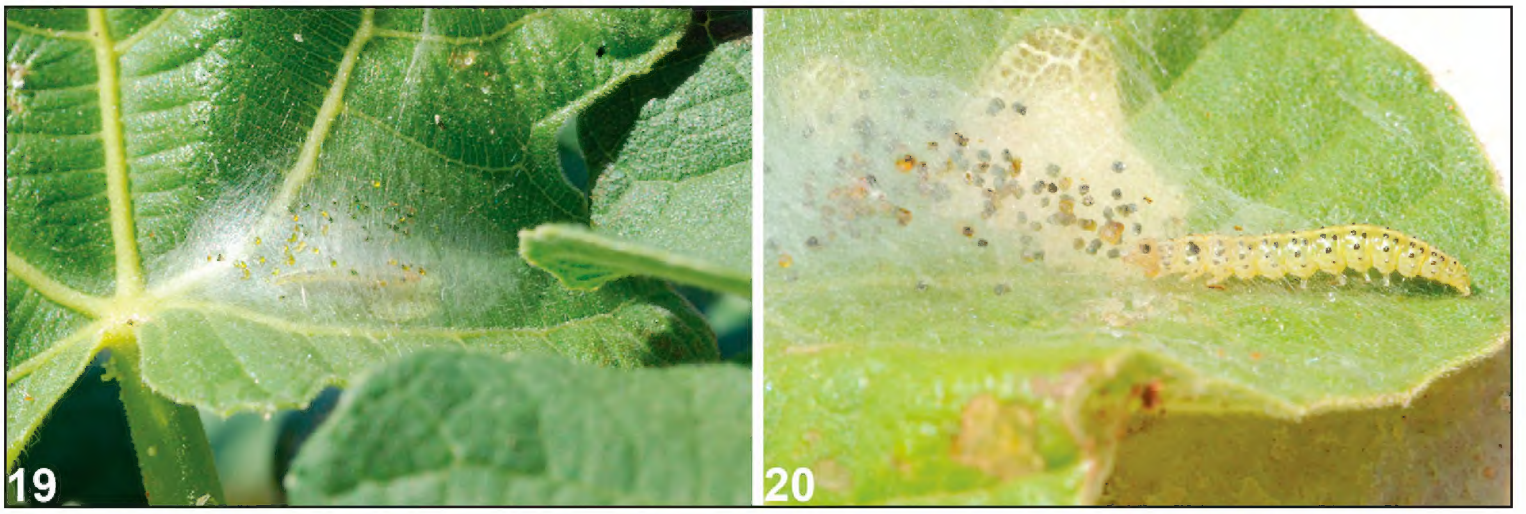
Male and female genitalia were illustrated by Diakonoff (1986): pls. 46, 47, figs 54-1 and 54-2 (male), pl. 127, fig. 54 (female).

Diagnosis. With its sub-triangular forewings with black and metallic markings adult *T. micalis* is unique among Madeiran Lepidoptera (Figs 7, 8). It can be separated from the similar *T. bjerkandrella* (Thunberg, 1784) by the presence of a subplical black and metallic spot in the forewing in *T. micalis*; such a spot is missing in *T. bjerkandrella* (Diakonoff 1986).

Molecular results. The successfully amplified *A. threnodes* COI haplotype is unique and it differs from the *A. alpinella* haplotype in 14 bases, and from the *A. fabriciana* haplotype in 12 bases. In the resulting phylogenetic tree, *Anthophila threnodes* and *A. fabriciana* are sister



Figures 17–18. *Anthophila threnodes* pupa (17) with the close-up of dorsal spines and lacunae (18).



Figures 19–20. *Choreutis nemorana*: larva under its webbing on the host plant *Ficus carica* (19) and larva exiting its web-shelter after being disturbed (20).

species, but without statistical support (PP or posterior probability = 0.81). Together, they are strongly supported as being the sister group to the North American species *Anthophila alpinella* (PP=1).

Discussion

One of the aims of this paper was to provide the necessary information for correctly identifying Madeiran choreutids because misidentifications have been common in the past. For example, *A. threnodes* was misidentified as *A. fabriciana* by Stainton (1859) (as '*Simaëthis Fabriciana* Linnaeus') and subsequent authors, and it remained as such on the list of Madeiran Lepidoptera

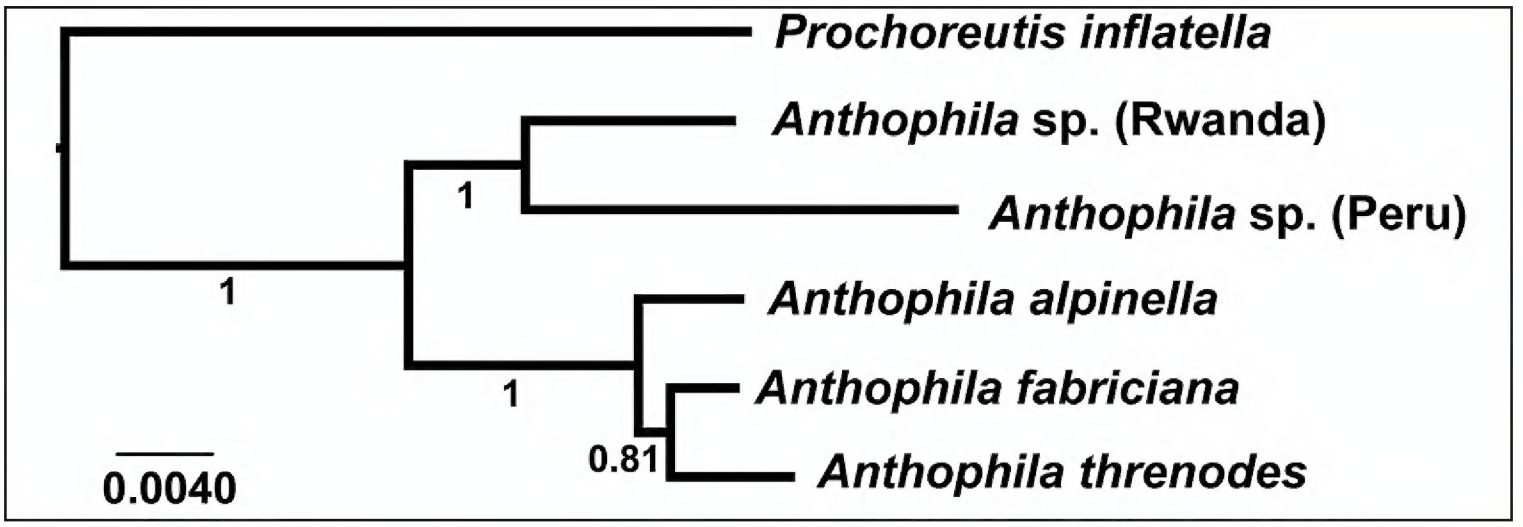


Figure 21. Bayesian tree showing the relationships among species of *Anthophila*. The numbers below branches are posterior probabilities.

until 2006 (Aguiar & Karsholt 2006). The specimen of *A. fabriciana* listed above is the only specimen of that species known from Madeira, while all the other ones previously identified as *A. fabriciana* are actually *A. threnodes*. Although *A. fabriciana* is a common species in mainland Europe, in addition to being recorded only once from Madeira, it has also been found only once in the Canary Islands, "based on a single specimen ("61978"), taken in April 1884 [in Tenerife], by the late Mr. J. H. Leech" (Walsingham 1908). The Lepidoptera fauna of the Canary Islands (and especially Tenerife) is relatively well studied, and it is surprising that *A. fabriciana* had not been found again in the islands, suggesting that the species failed to establish itself there, which is in agreement with Rebel's opinion (1911) that the single specimen might have resulted from an accidental importation.

Furthermore, *Tebenna bjerkandrella* (Thunberg), a species similar to *T. micalis*, has been noted as found in Madeira several times (e.g., by Walsingham 1894, 1908; Rebel 1911). However, all Madeiran specimens examined by us belong to the latter species, and the presence of *bjerkandrella* in Madeira requires confirmation. It is likely that records of *bjerkandrella* from other Macaronesian archipelagos also refer to *T. micalis* (Aguiar & Karsholt 2006).

The biology of the immature stages of *A. threnodes* is typical for the whole family. Spinning a thin web on or around the young leaves on which the larva feeds is known from a number of other genera (Rota 2005, Rota 2008b). Likewise, the morphology of the pupa is also shared with several other genera. For example, the dorsal lacunae (Figs 17, 18) that are found in the pupa of *A. threnodes* are also known to occur in the other species of *Anthophila* (Patočka 1999), as well as in *Asterivora* Dugdale (Dugdale 1979), *Caloreas* Heppner (Keifer 1937), *Hemerophila* Hübner (Rota unpublished), *Rhobonda* Walker (Rota 2005), *Prochoreutis* Heppner, and *Tebenna* Billberg (Patočka 1999). Their function remains unknown.

Finally, we discuss other choreutids that are known to occur on oceanic islands. For example, *Brenthia leptocosma* Meyrick is currently known only from Mauritius (Williams 1951). Then there is a species of *Choreutis* that appears to be a pest on *Ficus* sp. (Moraceae) on the Hawaiian islands (W. Nagamine, pers. comm.), and another species, *Niveas kone* Rota, is known from the Solomon Islands and Papua New Guinea (Rota and Miller 2013). All of this suggests that choreutids disperse fairly well, but most likely through passive wind dispersal because they are small moths without strong flight capabilities.

As *A. threnodes* is endemic to Madeira, it would be interesting to firmly establish its sister species so as to try to ascertain the origin of this species. We attempted to do so using molecular data, but were highly limited by the small amount of sequence that we obtained from our material and therefore our finding that *A. fabriciana* is the sister species of *A. threnodes* can only be taken as a preliminary result although this also appears to be supported by the close similarity of the two species in their external appearance, as well as their genitalia. Ideally, molecular work employing phylogeographic methods, conducted on freshly collected material of a large number of specimens of *A. alpinella*, *A. fabriciana*, and *A. threnodes*, as well as other potential close relatives of *A. threnodes*, would provide an answer with more certainty than we can do at this point.

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Appendix

Specimen information, sequence length, and GenBank accession numbers.

Species	voucher code	museum (ID No.)	CAD	COI-begin	COI-end	EF1a-begin	EF1a-end	GAPDH	IDH	MDH	RpS5	wingless
Prochoreutis inflatella	Pr_in_CT_1	-	850 bp	593 bp	756 bp	506 bp	675 bp	691 bp	-	321 bp	590 bp	400 bp
			JQ958422	KJ844047	HQ533107	HQ541504	HQ541504	JQ958449	-	KJ844059	JQ958499	HQ541579
Anthophila threnodes	An_th2	ZMUC	-	326 bp	-	-	-	580 bp	-	-	-	-
			-	KJ844048	-	-	-	KJ844052	-	-	-	-
Anthophila fabriciana	An_f_BE_2	-	412 bp	584 bp	774 bp	517 bp	675 bp	661 bp	402 bp	405 bp	596 bp	365 bp
			JQ958399	JQ958507	HQ533054	HQ541451	HQ541451	JQ958431	KJ844055	JQ958543	JQ958477	HQ541532
Anthophila alpinella	An_a_CA_2	-	412 bp	588 bp	774 bp	495 bp	645 bp	690 bp	697 bp	406 bp	596 bp	400 bp
			JQ958398	KJ844049	HQ533053	HQ541450	HQ541450	JQ958430	JQ958454	JQ958542	JQ958476	HQ541531
Anthophila sp. (Peru)	An_sp651	ZMUC	-	326 bp	-	-	-	298 bp	-	-	-	-
			-	KJ844050	-	-	-	KJ844053	-	-	-	-
Anthophila sp. (Rwanda)	An_JDP1_5570	RNCA (ENT 5570)	414 bp	620 bp	453 bp	177 bp	313 bp	691 bp	315 bp	-	550 bp	342 bp
			KJ844057	KJ844051	KJ844051	KJ844058	KJ844058	KJ844054	KJ844056	-	KJ844060	KJ844061

ZMUC: Zoological Museum, University of Copenhagen
RNCA: Royal Museum for Central Africa, Tervuren, Belgium